

at the time the invention was made to used the as deposited doping process ... as disclose in Mazuré et al. in the primary reference of Vo since as deposited doping is a conventional process used to form doped polysilicon layers."

Regarding "applicant's argument that as deposited polysilicon denotes a structural difference," the Examiner stated that "the applicant admits that the phrase 'as-deposited' describes a method of formation" and that "methods limitations have no patentable weigh in device claims ..." As such, the Examiner has refused to acknowledge any structural distinctions related to "as-deposited *polysilicon*" and has instead only asserted Mazuré et al. for teaching an "as deposited *doping* process." (emphasis added).

Thus, the Examiner's rejections are based upon the Examiner's blanket refusal to give patentable weight to structural limitations that may also implicate a process. Applicants stress, however, that the Examiner's position is legally untenable; the mere fact that a structural limitation implicates a process *does not* deprive that limitation of patentable weight as a structure.

Rather, Applicants note that the patent law is replete with cases holding that limitations indicating structural features, while also happening to implicate a process, are properly given patentable weight as *structural* limitations. For example, in *In re Moore* the Patent Office rejected a claim reciting "a mixture of highly fluorinated alkyladamantanes *prepared by fluorinating* an alkyladamantane" because, *inter alia*, the examiner treated this language as a product-by-process, rather than a structural, limitation. See *In re Moore*, 439 F.2d 1232, 169 U.S.P.Q. 221 (C.C.P.A. 1969) (emphasis added). The Court reversed the rejection and found that this language indeed constituted a structural limitation because "fluorinating an alkyladamantane" formed particular "highly fluorinated products." *Id.* at 239. Similarly, the Court in *In re Garnero* reversed the rejection of a claim reciting "expanded perlite particles which are *interbonded one to another by interfusion* between the surfaces of the perlite particles." See *In re Garnero*, 412 F.2d 276, 162 U.S.P.Q. 221 (C.C.P.A. 1969) (emphasis added). The Court found that while the phrase "interbonded one to another by interfusion between the surfaces of the perlite particles" implicated a process, it was also "capable of construction as [a] structural, rather than process, limitation[]." As such, because a structural interpretation was possible, the Court found that this language was properly interpreted to be a structural limitation carrying patentable weight. *Id.* at 223 (noting that phrases such as

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“‘intermixed,’ ‘ground in place,’ ‘press fitted,’ ‘etched,’ and ‘welded,’ all ... at one time or another have been separately held capable of construction as structural, rather than process, limitations.”). Likewise, the Court in *Hazani v. U.S. Intern. Trade Com’n* found that a claim reciting a “**chemically engraved**” conductive plate was a “true product” claim, not a product-by-process claim, because the limitation served to describe the product structurally; the Court found that “chemically engraved” described physical characteristics of the surface of the conductive plate. See *Hazani v. U.S. Intern. Trade Com’n*, 126 F.3d 1473, 44 U.S.P.Q.2d 1358 (Fed. Cir. 1997) (noting that limitations that describe a product structurally, while also implicating a process, may nevertheless be treated a “pure product” claim) (emphasis added). As such, Applicants submit that the limitation “as-deposited polysilicon” may not be dismissed as lacking patentable weight simply because that limitation also happens to implicate a process.

This legal standard is also inherent in the discussion of product-by-process claims in the M.P.E.P. In particular, the M.P.E.P. states that “once a product appearing to be **substantially identical** is found and a 35 U.S.C. 102/103 rejection made, the burden shifts to the applicant to show an unobvious difference.” M.P.E.P. §2113. The M.P.E.P. also cites *In re Thorpe* for the proposition that “even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the **product** itself ... If the product in a product-by-process claim is the **same** as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 U.S.P.Q. 964, 966 (Fed. Cir. 1985) (emphasis added). Thus, in such cases, the M.P.E.P. states that a limitation lacks patentable weight only if there is no structural distinction between the claimed product and the product disclosed by the prior art, *i.e.*, if the recited process is the only difference between the prior art and the claim under examination. Applicants note that this is to be distinguished from a rule that structural limitations which also implicate a process automatically lack patentable weight; Applicants submit that the M.P.E.P. does not espouse such a rule. Rather, under both established case law and the M.P.E.P., Applicants submit that a claim may not be rejected by ignoring structural limitations recited in a claim simply because those limitations also implicate a process for forming that structure.

Not only has the Examiner failed to show that “as-deposited polysilicon” appears identical to the structure of Vo, as required by M.P.E.P. §2113, but, in fact, the Examiner has ignored **evidence** that proves the opposite. Regarding Claim 33, Applicants stress that “as-

deposited polysilicon" indicates a polysilicon layer with particular structural features. This is made clear, for example, in the article by Kakkad et al., "Crystallized Si Films By Low-Temperature Rapid Thermal Annealing of Amorphous Silicon," J. Appl. Phys., Vol. 65, No. 5 (March 1, 1989), pp. 2069-2072, provided in a previously submitted Supplemental Information Disclosure Statement. In particular, Kakkad et al. state that annealed amorphous silicon has crystalline grains which are larger than the grains of as-deposited silicon layers: "[u]nlike deposited polycrystalline films, [annealed] α -Si films have grain size exceeding the film thickness." Kakkad et al., Summary, p. 2072, Col. 2; *see also*, Beyer et al., U.S. Patent No. 5,192,708, Col. 1, line 58 to Col. 2, line 7 (stating that "as-deposited polysilicon" has a smaller grain size than annealed amorphous silicon). Consequently, the skilled artisan understands that "as-deposited polysilicon" describes polysilicon with particular *structural characteristics*, different from, *e.g.*, silicon deposited as amorphous silicon (α -Si) and annealed to form polycrystalline silicon.

Moreover, this structural distinction is of significant consequence. Kakkad et al. points out that "as-deposited" polysilicon and annealed amorphous silicon have different electrical properties. For example, Kakkad et al. measured a conductivity of 500 S/cm for as-deposited polysilicon, whereas annealed amorphous polysilicon with the same doping concentration had a conductivity of 160 S/cm. Kakkad et al., p. 2071, Table II; *see also*, Beyer et al., U.S. Patent No. 5,192,708, Col. 1, line 58 to Col. 2, line 7 and Col. 4, lines 55 to 64 (stating that annealed amorphous silicon has different resistivity from "as-deposited polysilicon"). Thus, different conductivity is yet another structural property distinguishing "as-deposited polysilicon" from polysilicon formed by other methods. Consequently, Applicants submit that "as-deposited polysilicon" is a structural limitation that describes a particular type of polysilicon with, *e.g.*, a particular crystalline structure.

Given this structural distinction, Applicants note that neither Vo nor Mazuré et al. specify the nature of the polycrystalline silicon filling the disclosed narrow, deep holes. Nor does either reference teach any manner of processing that would indicate to the skilled artisan the structural nature of the polycrystalline silicon. Rather, both references simply describe the silicon filling the trenches of those patents as "polysilicon," without more. *See, e.g.*, Vo, Col. 5, lines 21-31 and Mazuré et al., Col. 4, lines 9-20. Moreover, Applicants note that prior to the present invention, conventional methods of filling trenches with polysilicon typically included filling the

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trenches with amorphous silicon and then annealing to form polysilicon. *See, e.g.*, Beyer et al., (filling trenches with amorphous silicon by CVD and annealing to form polysilicon); Oguro, U.S. Patent No. 5,192,708 (depositing amorphous silicon in a trench and "crystalliz[ing]" the amorphous silicon by "heat treatment" to form polycrystalline silicon); *see also* Arienzo et al., "In Situ Asenic-Doped Polysilicon for VLSI Applications," Vol. ED-33, No. 10 (October 1986), pp. 1535-1538. Moreover, conventional prior art processes were considered incapable of filling trenches with "an aspect ratio greater than about 20:1" with "as-deposited polysilicon," as recited by Claim 33. *See, e.g.*, Beyer et al., Col. 4, lines 55 to 64 (noting that a conventional "CVD polysilicon trench fill process" could not "achieve good trench filling of an 8:1 aspect ratio"); *see also* Oguro, Col. 4, lines 24-31 and Figure 1b (stating that prior art processes deposited polycrystalline silicon films with such poor step coverage that voids were formed because deposited films closed off the openings of trenches). Consequently, Applicants submit that the combination of Vo and Mazuré et al. does not teach nor suggest the invention of independent Claim 33 as recited.

Accordingly, in light of the remarks herein, Applicants respectfully traverse the rejections and submit that the pending claims are allowable over the art of record. Applicants have not addressed the further rejections of dependent claims as being moot in view of the remarks herein. However, Applicants expressly do not acquiesce in the Examiner's findings not addressed herein. Indeed, Applicants submit that the dependent claims recite further distinguishing features of particular utility.

Request for Telephonic Interview

To further clarify the issues discussed above, Applicants respectfully request a telephonic interview with the Examiner. Applicants request that the Examiner call the undersigned to arrange an interview at the Examiner's convenience.

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CONCLUSIONS

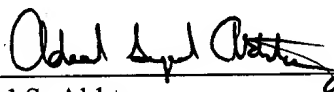
In view of the foregoing remarks, Applicants submit that the application is in condition for allowance and respectfully request the same. If some issue remains that the Examiner feels may be addressed by Examiner's amendment, the Examiner is cordially invited to call the undersigned for authorization.

Respectfully submitted,

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By: _____



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